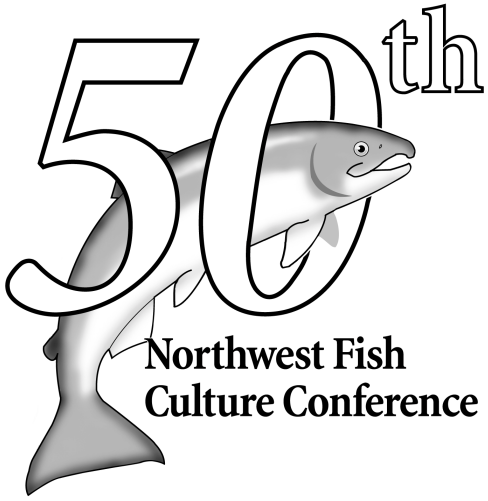
Session III:

Fish Health



Session Chair:

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- FLAVOR-TABS -
ARE FISH THAT PICKY ABOUT HOW THEY ARE GIVEN THEIR MEDICINE?

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Abstract

Over the past three years, some of the requirements necessary to adequately deliver therapeutic levels of antibiotics to production levels of fish without adding the antibiotic to the feed have been examined. These evaluations utilized bulk products approved for use in the poultry and swine industries. Such products can be utilized in aquaculture under extra-label use by veterinarian prescription. Some of the variables that have been identified for effective therapeutic delivery are pellet antibiotic concentration, the # of pellets available per fish (pellet size / weight), the water temperature, pellet palatability and most recently, there appears to be an increasing demand to insure that the pellets are "non-nutritive". This paper specifically addresses palatability and compares pellets with different flavorings. The results from evaluations conducted at the Entiat and Winthrop NFH's on spring chinook salmon, with "Ery-mycin" (a poultry erythromycin product) will be presented. Palatability was evaluated by measuring tissue levels of erythromycin in the fish after being fed different flavored pellets. A flavor was considered "highly palatable" if tissue residue levels of erythromycin were high and "non-palatable" or of "low palatability" if tissue levels were low. Pellet flavorings included: fish, krill, anise, chocolate, vanilla, garlic, berry, orange, molasses and some combinations of flavors. While tissue residue levels of erythromycin did vary, dependent upon pellet flavor, most of the flavors tested yielded erythromycin tissue residue levels that were considered therapeutically acceptable.

EFFECT OF ERYTHROMYCIN FEED TREATMENTS ON BKD AND SURVIVAL OF SPRING CHINOOK SALMON AT WARM SPRINGS NATIONAL FISH HATCHERY

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Abstract

The effects of erythromycin-medicated feed on bacterial kidney disease (BKD) and survival of spring chinook salmon (Oncorhynchus tshawytscha) has been investigated at Warm Springs National Fish Hatchery since brood year 1993. Control and treatment groups were reared in separate ponds and uniquely coded-wire tagged. Medicated treatments consisted of Aquamycin in BioOregon Biodiet feed. Juvenile fish received the medicated treatment during two 21-day feed trials, one during their first spring (May/June) and the next approximately 90 days later (August/September). The objectives of the study at Warm Springs National Fish Hatchery were to determine the effect of feeding erythromycin on: 1) survival (mortality) rates of juveniles during hatchery rearing, 2) levels of soluble antigen produced by Renibacterium salmoninarum in juveniles, 3) levels of soluble antigen produced by R. salmoninarum in adults at spawning, and 4) survival to adult. Juvenile fish were examined for signs of toxicity and ELISA techniques were used to index detection of BKD. Overall health, survival and growth was also monitored. Coded-wire tags were used to compare release to adult recovery survival of each treatment group. Preliminary results have not shown a consistent difference in occurrence of BKD in control and treatment groups in juvenile fish. However, there was a consistent adult survival advantage for the medicated treatment groups. The smolt- to- adult survival rate and adult yield from using medicated feed at the hatchery was the difference between having and not having a sustainable production program for broodyears 1993 through 1995. This study is on-going and is planned to continue at least through the 1998 brood. Adult recoveries will be assessed through return year 2003.

ERYTHROMYCIN FEED TREATMENT CAN REDUCE THE OSMOREGULATORY ABILITY OF JUVENILE CHINOOK SALMON IN SALTWATER

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Abstract

Erythromycin treatment is a frequently prescribed therapy for Bacterial Kidney Disease (BKD), a common obstacle to the artificial propagation of chinook salmon (Oncorhynchus tshawytscha). Typically these propagation programs release smolts with the expectation that they will migrate quickly to the ocean. However, the effect erythromycin may have on the ability of smolts to osmoregulate once they reach seawater has not been fully explored. We examined erythromycin's effect on the osmoregulatory ability of juvenile chinook salmon in saltwater. During August and September 1997, post-smolts were fed erythromycin treated feed at a target dose of 100 mg / kg body weight^{-1} / day^{-1} for 28 days . From March through June 1998, smolts were fed erythromycin treated feed at a target dose of 100 mg / kg body weight^{-1} / day^{-1} either every day for 28 days or every other day for 84 days. Control groups for both years were fed non-medicated feed. After a 9-11 day detoxification period, osmoregulatory ability was evaluated using a saltwater challenge (SWC) in 1997 and 1998. In 1998 a salinity tolerance test (STT) was done, gill Na^+/K^+ ATPase activity was measured, and tissue samples were analyzed to determine the erythromycin concentration in the posterior kidney, anterior kidney, brain, and liver. In 1997 the post-smolts in the 28 day treatment group had a reduced ability to regulate Na^+ ions in saltwater. In 1998 smolts fed erythromycin every other day for 84 days had significantly higher mortality in a STT than the control group. However, in 1998, treatment with erythromycin did not affect the ability of smolts to regulate Na^+ ions in saltwater or influence the Na^+/K^+ ATPase activity in their gill tissue. In 1998 both treatment groups had higher levels of erythromycin in the liver, posterior kidney, and anterior kidney than the controls. Overall, these data suggest that feed treatment with erythromycin results in the accumulation of the antibiotic in certain tissues and can reduce the ability of hatchery smolts to osmoregulate and survive in seawater. Thus, fish culturists who use erythromycin as a therapy for BKD should consider the timing of treatment with respect to smolt outmigration.

MANAGING *MYXOBOLUS CEREBRALIS* INFECTIONS AT TWO IDFW-OPERATED CHINOOK HATCHERIES IN THE UPPER SALMON RIVER

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Abstract

Myxobolus cerebralis, the parasite that can cause whirling disease, was first detected in 1987 in juvenile chinook salmon at two upper Salmon River hatcheries operated by Idaho Department of Fish and Game (IDFG). These mitigation facilities, Sawtooth Fish Hatchery (LSRCP) and Pahsimeroi Hatchery (Idaho Power) have limited ground water available and have to rely on river water for smolt production. As expected, the open river water supplies of both facilities were demonstrated to contain the infectious stage of the parasite while the well water supplies did not. IDFG applied methods used successfully in European trout culture to minimize the prevalence and intensity of M. cerebralis infection. Specifically, chinook were reared on well water to a minimum length of 75 mm and weight of 3.5 g (3", 130 fpp) before juveniles were exposed to river water. The two facilities differ on the type of final rearing containers used: Sawtooth has cement raceways for rearing to the smolt stage while Pahsimeroi has earthen and gravel bottomed ponds.

At Sawtooth,, prior to adopting the delayed exposure strategy, chinook juveniles of BY 85 - 93 were reared on well water until May before ponding onto river water at a size of about 45 mm. Sawtooth chinook of BY 94 to the present have been reared on well water into August before being exposed to river water. At Pahsimeroi, ponding of BY 85 – 93 was carried outdirectly on river water at swim-up in December through February. Delayed exposure was accomplished by rearing BY 95 – 97 Pahsimeroi chinook on well water at Sawtooth until July. Chinook at each facility have been routinely examined by the pepsin/tryspin digest method prior to release as part of our fish health monitoring program. These data were used to evaluate the effectiveness of this delayed exposure rearing strategy and to compare culture in cement raceways with earthen pond culture.

Results of IDFG's annual monitoring of pre-release smolts demonstrated a reduction in the detection of M. cerebralis at both facilities as the result of this delayed exposure to river water. Detections at Sawtooth and Pahsimeroi hatcheries were reduced from 11% to 1.6% and from 48 % to 12% respectively.

It is interesting to note that the infection level at Sawtooth prior to adopting the delayed exposure is the same as that found with naturally produced chinook juveniles from the upper Salmon River. It appears that the level of challenge was greater at Pahsimeroi

than Sawtooth which may be the result of rearing in earthen ponds compared to cement raceways. Pahsimeroi chinook which were raised in river water from swim-up developed whirling disease signs by the end of the first summer whereas chinook at Sawtooth never showed disease signs. There has not been sufficient time for the results of this culture practice to appear as a change in detection of the parasite in adult returns. However, detections of M. cerebralis in adult chinook and steelhead returning to both facilities during the last twelve years have been decreasing. In addition, there has been no correlation of M. cerebralis detection rate as smolts with smolt-to-adult survival for chinook for return years 1988 to 1999, which indicates that factors other than infection rate of the parasite have a greater influence on survival.

Our recommendation for these two related programs is to expand the well water supply at Pahsimeroi Hatchery to allow incubation and early rearing through July on water free of the infectious stage of M. cerebralis and to replace the earthen ponds with raceways. This would eliminate the need to raise Pahsimeroi chinook at Sawtooth and would allow Sawtooth chinook to be consistently reared on well water through the summer.

Effect of Delaying Exposure of Chinook Juveniles to River Water at Sawtooth and Pahsimeroi Hatcheries on Detection of M. cerebralis at Pre-Release Sampling (the Following Spring).